epiREPORT

Manitoba Health, Healthy Living and Seniors

ANNUAL INFLUENZA REPORT, 2014–2015

July 1, 2014 – June 30, 2015

Epidemiology & Surveillance
Public Health Branch

Public Health and Primary Health Care Division

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Manitoba

TABLE OF CONTENTS

Executive Summary 5
Reporting Weeks 6
Acronyms 6
Introduction 7
Syndromic Surveillance 8
Sentinel Surveillance of ILI 8
Health Links – Info Santé 9
Laboratory Reporting 10
Influenza A 10
Influenza B 12
RHAs 13
Hospitalizations, ICU Admissions and Deaths 14
Laboratory-confirmed Outbreaks 17
Immunizations 18
Uptake 18
Providers 21
Adverse Events Following Immunization (AEFI) 22
Antiviral Dispensing 24
Strain Characterization and Antiviral Resistance 24
Discussion 25

LIST OF FIGURES

Figure 1 Percent of patient visits to sentinel physicians due to ILI by week and season 8

Figure 2 Calls to Health Links–Info Santé by week and season 9

Figure 3 Types of calls to Health Links–Info Santé by week in 2014–2015 10

Figure 4 Laboratory-confirmed influenza A cases by week and season 11

Figure 5 Influenza A cases by week in 2014–2015 and historical average 11

Figure 6 Incidence rate (/100,000) of influenza A by age group and season 12

Figure 7 Laboratory-confirmed influenza B cases by week and season 12

Figure 8 Influenza B cases by week in 2014–2015 and historical average 13

Figure 9 Incidence rate (/100,000) of influenza B by age group and season 13

Figure 10 Incidence rate (/100,000) of influenza A by region and season 14

Figure 11 Influenza associated hospitalizations, ICU admissions, and deaths by week in 2014–2015 15

Figure 12 Influenza A associated hospitalizations, ICU admissions, and deaths by age group in 2014–2015 16

Figure 13 Influenza B associated hospitalizations, ICU admissions, and deaths by age group in 2014–2015 17

Figure 14 Outbreaks of influenza A and B by week in 2014–2015 18

Figure 15 Influenza immunization uptake rate (%) by age group in 2014–2015 20

Figure 16 Influenza immunization uptake rate (%) by region and age group in 2014–2015 21

Figure 17 Influenza vaccine doses by provider type and month in 2014–2015 22

Figure 18 Units of Oseltamivir dispensed by week in 2014–2015 24

LIST OF TABLES

Table 1 Incidence rate (/100,000) of influenza A and B by RHA in 2014–2015 14

Table 2 Hospitalizations, ICU admissions and deaths by influenza type in 2014–2015 15

Table 3 Influenza immunization uptake rate (%) by region and age group in 2014–2015 20

Table 4 Influenza vaccine doses by provider type and month in 2014–2015 21

Table 5 Influenza vaccine doses (%) by provider type and client age group in 2014–2015 22

Table 6 Adverse events following influenza immunization by age group in 2014–2015 23

Table 7 Types of adverse events following influenza immunization in 2014–2015 23

Table 8 Levels of care required and outcomes for adverse events following influenza immunization in 2014–2015 24

Table 9 Strain characterization of influenza isolates in Manitoba and Canada in 2014–2015 ... 25

Table 10 Antiviral resistance of influenza isolates in Manitoba and Canada in 2014–2015 25

Executive Summary

Seasonal influenza can cause severe morbidity and mortality at extremes of life. In Manitoba, influenza is a reportable disease under *The Public Health Act*. Routine monitoring of influenza is performed by Manitoba Health, Healthy Living and Seniors (MHHLS) through a variety of mechanisms. Surveillance data are reported in a weekly bulletin during an influenza season. This end of season report provides an overview for the 2014–2015 influenza season between July, 2014 and June, 2015 in Manitoba.

The 2014–2015 influenza season in Manitoba was characterized with the highest morbidity and mortality since the 2009 influenza A(H1N1) pandemic season. There were prolonged severe health outcomes among older Manitobans. Influenza A activity started to increase at the beginning of December and peaked shortly after Christmas. A high level of activity was maintained until the end of January. Influenza B activity started to increase in February and peaked at the end of March, which resulted in a prolonged and low level of influenza activity until mid May.

Two factors contributed to the high disease activity level in the 2014–2015 season. First, the predominant circulating subtype in 2014–2015 was influenza A(H3N2), a strain that typically affects the older population and causes higher levels of morbidity compared to other strains. Second, the vaccine effectiveness against the circulating influenza A(H3N2) strain during this season was low due to a mismatch between the vaccine and the predominant circulating virus as a result of significant antigenic drift in the circulating influenza A virus.

Reporting Weeks

Time trends in this report were analyzed by epidemiology week, a schedule used by the national FluWatch program coordinated by the Public Health Agency of Canada (PHAC).

Week	Start	End
27	29-Jun-14	05-Jul-14
28	06-Jul-14	12-Jul-14
29	13-Jul-14	19-Jul-14
30	20-Jul-14	26-Jul-14
31	27-Jul-14	02-Aug-14
32	03-Aug-14	09-Aug-14
33	10-Aug-14	16-Aug-14
34	17-Aug-14	23-Aug-14
35	24-Aug-14	30-Aug-14
36	31-Aug-14	06-Sep-14
37	07-Sep-14	13-Sep-14
38	14-Sep-14	20-Sep-14
39	21-Sep-14	27-Sep-14
40	28-Sep-14	04-Oct-14
41	05-Oct-14	11-Oct-14
42	12-Oct-14	18-Oct-14
43	19-Oct-14	25-Oct-14
44	26-Oct-14	01-Nov-14
45	02-Nov-14	08-Nov-14
46	09-Nov-14	15-Nov-14
47	16-Nov-14	22-Nov-14
48	23-Nov-14	29-Nov-14
49	30-Nov-14	06-Dec-14
50	07-Dec-14	13-Dec-14
51	14-Dec-14	20-Dec-14
52	21-Dec-14	27-Dec-14
53	28-Dec-14	03-Jan-15

Week	Start	End
1	04-Jan-15	10-Jan-15
2	11-Jan-15	17-Jan-15
3	18-Jan-15	24-Jan-15
4	25-Jan-15	31-Jan-15
5	01-Feb-15	07-Feb-15
6	08-Feb-15	14-Feb-15
7	15-Feb-15	21-Feb-15
8	22-Feb-15	28-Feb-15
9	01-Mar-15	07-Mar-15
10	08-Mar-15	14-Mar-15
11	15-Mar-15	21-Mar-15
12	22-Mar-15	28-Mar-15
13	29-Mar-15	04-Apr-15
14	05-Apr-15	11-Apr-15
15	12-Apr-15	18-Apr-15
16	19-Apr-15	25-Apr-15
17	26-Apr-15	02-May-15
18	03-May-15	09-May-15
19	10-May-15	16-May-15
20	17-May-15	23-May-15
21	24-May-15	30-May-15
22	31-May-15	06-Jun-15
23	07-Jun-15	13-Jun-15
24	14-Jun-15	20-Jun-15
25	21-Jun-15	27-Jun-15
26	28-Jun-15	04-Jul-15

Acronyms

AEFI	Adverse event following immunization
CPL	Cadham Provincial Laboratory
DPIN	Drug Programs Information Network
E&S	Epidemiology and Surveillance, unit of MHHLS
EIA	Enzyme immunoassay
ICU	Intensive Care Unit
ILI	Influenza-like illness
MHHLS	Manitoba Health, Healthy Living and Seniors
MIMS	Manitoba Immunization Monitoring System
MOH	Medical Officer of Health
NML	National Microbiology Laboratory
PCR	Polymerase chain reaction
PHCC	Provincial Health Contact Centre
PHAC	Public Health Agency of Canada
RHA	Regional Health Authority

Introduction

This report details the influenza activity in Manitoba for the 2014–2015 season between July 1, 2014 and June 30, 2015. Epidemiology and Surveillance (E&S) in Public Health Branch of MHHLS routinely monitors and reports the disease activity during each influenza season. In the 2014–2015 season, the highest influenza morbidity and mortality since the 2009 influenza A(H1N1) pandemic season was observed. Overall:

- There were 1,075 influenza A cases and 217 influenza B cases with laboratory confirmation.
- The predominant circulating subtype this season was influenza A(H3N2), a strain that typically affects the older population and causes higher levels of morbidity. Consequently, older people were affected the most this season.
- The influenza A season peaked in Week 53 (December 28, 2014– January 3, 2015) and the influenza B season peaked in Week 13 (March 29, 2015–April 4, 2015).
- There were 350 hospitalizations associated with laboratory-confirmed influenza diagnosis, of which 62 resulted in an intensive care unit (ICU) admission. Among those in-patients, 50% were over 70 years of age. Additionally, there were 48 influenza associated deaths, of which 37 were 80 years of age and older.
- There were 105 laboratory-confirmed influenza outbreaks reported, which mostly occurred in long-term care facilities.
- The provincial vaccine uptake in 2014–2015 was 22.3%, which was similar to the vaccine uptake in 2013–2014.
- Pharmacists delivered 17% of all influenza vaccine doses administered.
- Drifting of the influenza A(H3N2) strain resulted in a vaccine mismatch and near zero vaccine effectiveness against the predominant circulating influenza A(H3N2) strain.
- The rate of adverse events following the seasonal influenza immunization was 13.1 episodes per 100,000 doses administered, which was lower than in 2013–2014.

A variety of data sources and surveillance indicators were evaluated to identify and monitor the arrival of influenza, intensity of activity, and the characteristics of those infected, as well as severity and trends. Surveillance data analyzed for this report include:

- Syndromic surveillance
    a. Sentinel surveillance of influenza-like illness (ILI) in the community
    b. Influenza-related calls to Health Links–Info Santé
- Laboratory reports of influenza infections
- Hospitalizations, ICU admissions, and deaths associated with laboratory-confirmed influenza diagnosis
- Laboratory-confirmed influenza outbreaks
- Influenza immunizations including vaccine uptake, service providers, and adverse events following immunization
- Influenza antiviral dispensing
- Strain characterization of influenza and antiviral resistance.

Syndromic Surveillance

Sentinel Surveillance of ILI

Manitoba participates in *FluWatch*, the Canada's national surveillance system co-ordinated by PHAC, which monitors the spread of influenza and ILI on a year-round basis. *FluWatch* consists of a network of laboratories, hospitals, doctor's offices and provincial and territorial ministries of health.

ILI in the general population is defined as:

> Acute onset of respiratory illness with fever and cough and with one or more of the following: sore throat, arthralgia, myalgia, or prostration which is likely due to influenza. In children under the age of 5, gastrointestinal symptoms may also be present. In patients under 5 or over 65 years of age, fever may not be prominent.

In Manitoba, there are sentinel physicians throughout the province reporting to *FluWatch* weekly. Sentinels can also opt into the voluntary swabbing component of the program. This consists of the submission of either two posterior pharyngeal swabs or two nasopharyngeal swabs within 48 hours of symptom onset from patients presenting with ILI. Requisitions, swabs, and antiviral transport media are available from Cadham Provincial Laboratory (CPL). E&S receives weekly reports from *FluWatch* which present the ILI rate for Manitoba and for each of the participating sentinel physicians. In 2014–2015, there were 27 sentinel physicians recruited in Manitoba.

During the 2014–2015 season, ILI consultations occurred year-round and peaked in Week 53 (December 28, 2014–January 3, 2015) when approximately 13% of patient visits were due to ILI. Note that the ILI rate this season during the epidemic was lower than those observed in 2013–2014 and 2012–2013, the two influenza A predominant seasons (Figure 1). This is counterintuitive to the fact that the influenza activity level this season was higher than the two previous seasons.

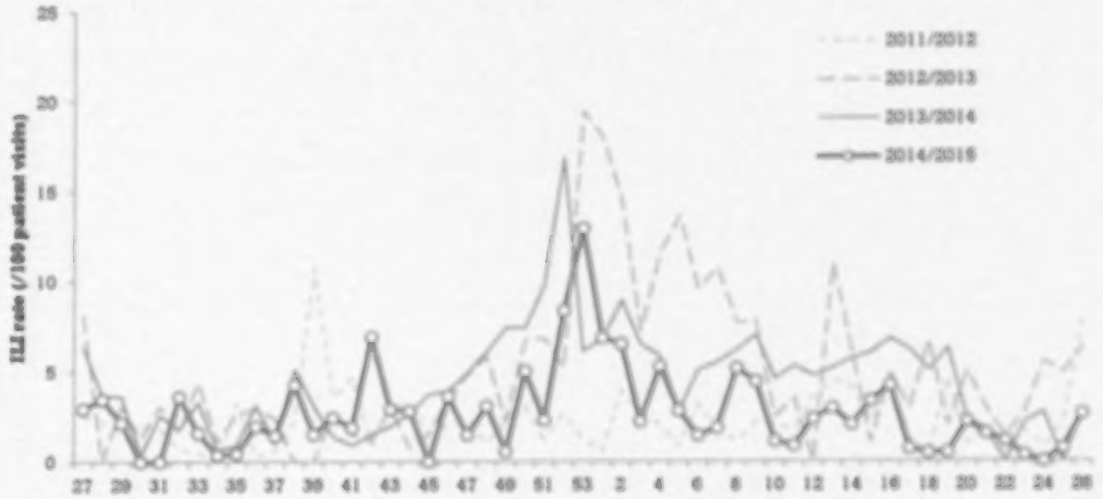

Figure 1 Percent of patient visits to sentinel physicians due to ILI by week and season

Health Links – Info Santé

Health Links–Info Santé is one of 30 inbound and outbound calling programs offered by the Provincial Health Contact Centre (PHCC). Implemented in 1994, this bilingual program was the first telephone, nurse-based triage system in Canada. It is operated by Misericordia Health Centre in partnership with MIGHLI and Winnipeg Regional Health Authority (WRHA). A staff of 80 full- and part-time registered nurses work for this triage system that answers calls 24 hours a day, seven days a week, 365 days a year. Interpreters are available for over 100 different languages.

During each call, a nurse will obtain information about symptoms and follow clinical protocols on the computer screen to offer advice on whether to treat the symptoms at home, see a family doctor, or visit an emergency room. Calls range from concerns about abdominal pain to influenza virus symptoms.[1] When callers phone Health Links–Info Santé and select Influenza Service, they are given an option to select information on: (1) the groups of individuals who are at an increased risk of serious illness, (2) how to arrange an influenza vaccine, (3) the annual influenza immunization campaign, or (4) the management of influenza and its potential complications. E&S receives the aggregate data from Health Links–Info Santé Influenza Service weekly.

Similar to previous seasons, there were two clear peaks in influenza-related calls to Health Links–Info Santé in 2014–2015 (Figure 2). The first peak in Week 42 (October 19–25, 2014) coincided with the onset of the annual influenza immunization campaign. The proportion of calls attributed to questions related to the influenza clinics and influenza program also peaked around the same time (Figure 2). The second and much lower peak occurred in Week 53 (December 28, 2014–January 3, 2015) when influenza activity peaked. Note that the two peaks this season were much lower than in the three previous seasons.

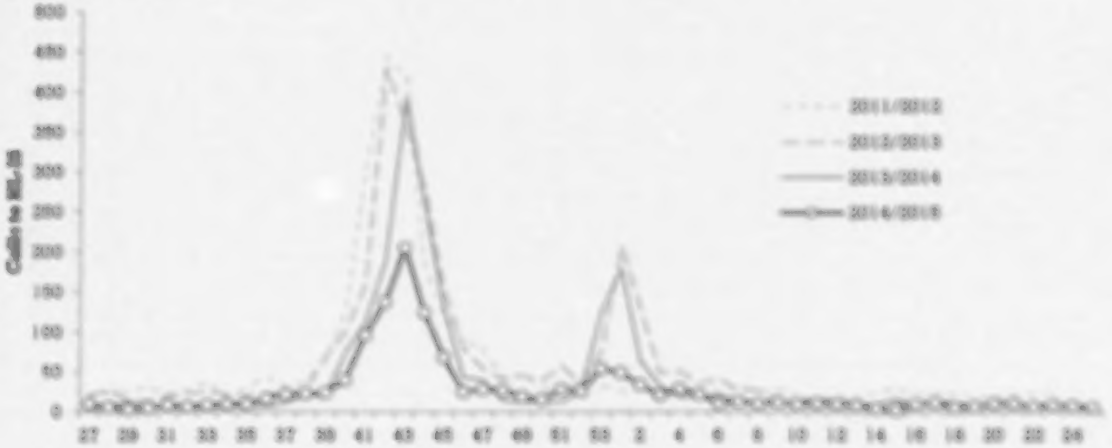

Figure 2 Calls to Health Links–Info Santé by week and season

[1] Source: http://www.misericordia.mb.ca/Programs/PHCC.html

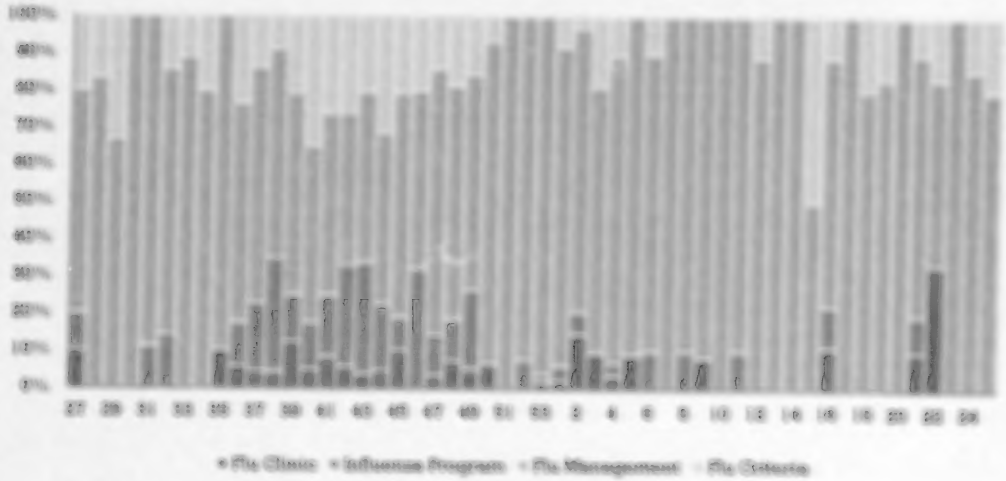

Figure 3 Types of calls to Health Links–Info Santé by week in 2014–2015

Laboratory Reporting

Reports of influenza nucleic acid detection, culture isolation and enzyme immunoassay (EIA) detections from CPL (and occasionally other labs) are routinely forwarded to CMD within 24 hours of confirmation. Within this report, the specimen collection date was used to assign a case to the reporting week. Therefore, this report contains positive laboratory reports of tests with specimen collection dates between July 1, 2014 and June 30, 2015. For consistency, only Manitoba residents who were registered with MHSIS for health care coverage were included.

In the 2014–2015 influenza season, there were 1,075 laboratory-confirmed cases of influenza A and 217 laboratory-confirmed cases of influenza B reported in Manitoba. Of the 1,075 influenza A cases, 615 (57%) were influenza A(unsubtyped), 338 (31%) were influenza A(H3), and 119 (11%) were influenza A(H3N2).

Influenza A

Sporadic cases of influenza A started to appear in Week 39 (September 21–27, 2014) and the last case was reported in Week 18 (May 3–9, 2015); the seasonal epidemic began in Week 49 (November 30–December 6, 2014) and peaked in Week 53 (December 28, 2014– January 3, 2015). Compared to previous influenza A seasons since the 2009 pandemic season, the 2014–2015 season progressed rapidly reaching an earlier and higher peak within four weeks after the epidemic began (Figure 4).

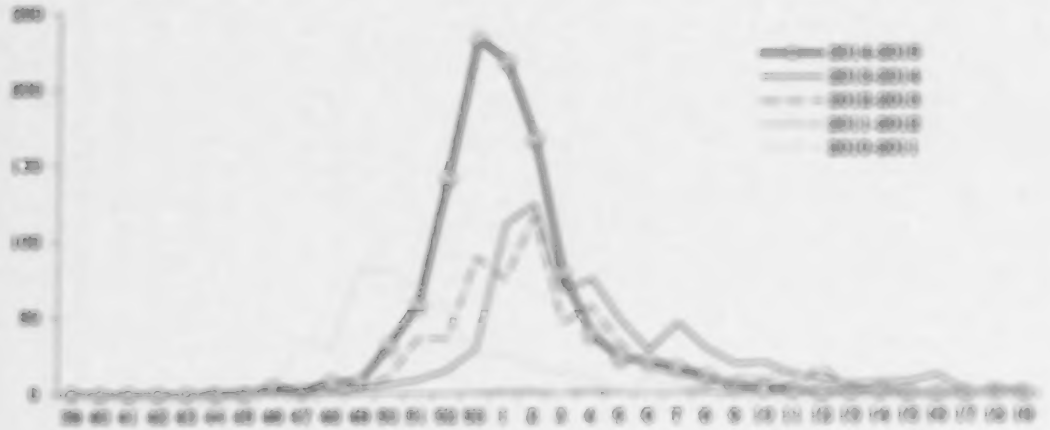

Figure 4 Laboratory-confirmed influenza A cases by week and season

It is known that peak transmission varies widely from year to year. To compare the current season on a weekly basis to previous seasons, the curves of weekly influenza A cases in previous influenza A predominant seasons were aligned on the peak of the same curve in 2015-2016. Subsequently, the historical average number (95% confidence intervals) of influenza A cases by each week were calculated (Figure 5). It is evident that there were significantly more cases each week between Week 52 (December 21–27, 2015) and Week 4 (January 25–31, 2016) than the average of previous influenza A seasons. Specifically, 233 cases were reported in Week 53 in 2015-2016 compared to 107, the average of previous influenza A predominant seasons in the peak week.

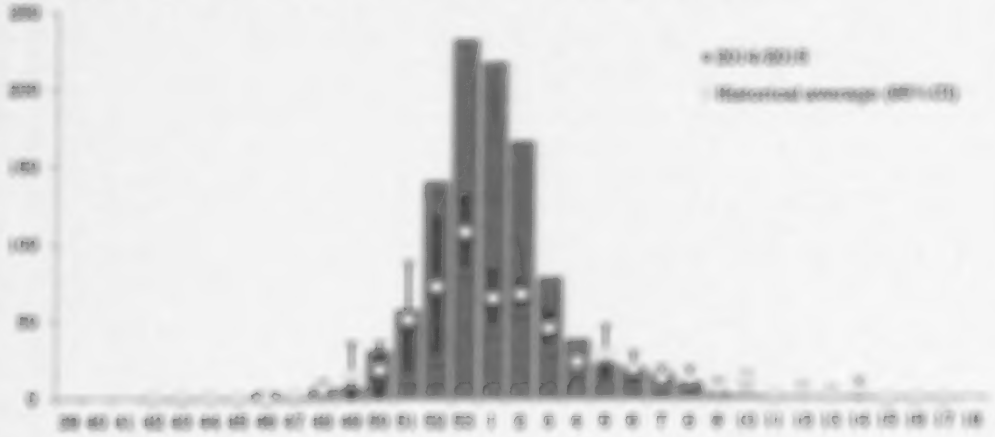

Figure 5 Influenza A cases by week in 2015-2016 and historical average

Older people were affected the most this season. Generally, there were more confirmed cases and higher incidence rates among people over the age of 50 than among people under the age of 50 (Figure 6). Note that 54% of all reported influenza A cases occurred in adults over the age of 70. The highest number of cases and the highest incidence rate occurred among those over the age of 80. Specifically, 439 cases (40.9%) were reported among people over the age of 80, which resulted in an

incidence rate of 837 cases per 100,000 population.[1] The second highest incidence rate was observed among children under the age of one (218 cases per 100,000 population), but there were only 38 cases in this age group. Compared to the four previous influenza A seasons (including 2013/2014), the last influenza A(H3N2) predominant season), the incidence rate among older people, especially those over the age of 60, was substantially higher in 2013/2015.

Figure 6 Incidence rate (/ 100,000) of influenza A by age group and season

Influenza B

Though influenza B cases occurred sporadically throughout the season, the epidemic started when the influenza A activity level decreased and peaked in Week 10 (March 29-April 4, 2015), around three months after the peak of influenza A (Figure 7). After Week 18 (May 10-16, 2015), the influenza B activity level started to decrease. Compared to the four previous influenza B seasons, the peak of laboratory-confirmed cases of influenza B in 2013/2015 was higher than peaks in influenza B predominant seasons but lower than the peak in 2011/2012, the last influenza B predominant season.

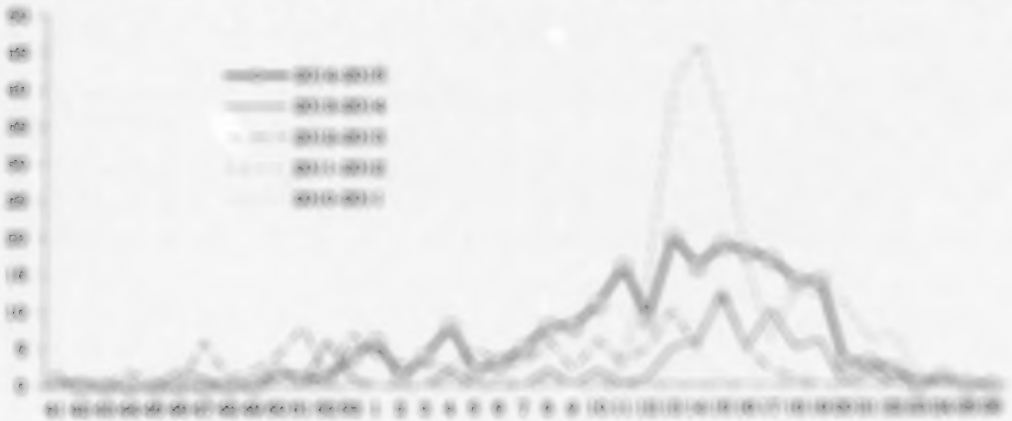

Figure 7 Laboratory-confirmed influenza B cases by week and season

[1] Population counts in denominators in this report were based on all registered residents with Hong Kong ID card in June 1, 2014.

A similar method was used to calculate the historical average number (95% confidence intervals) of influenza A cases by each week (Figure 6). In 2018-2019, the weekly number of influenza A cases was significantly higher than the historical average in most weeks during the epidemic.

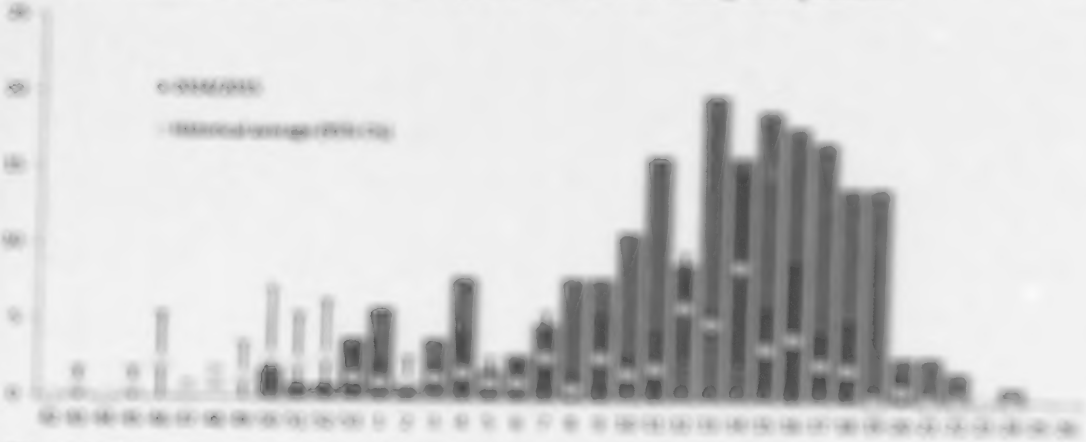

Figure 6 Influenza A cases by week in 2018-2019 and historical average

Unlike influenza B, influenza A affected younger populations. This season, most influenza A cases (78%) were under the age of 50 (Figure 8). However, similar to influenza B, the highest incidence rate was still among older adults over 80 years of age (50 cases per 100,000 population) and followed by children under one (38 cases per 100,000 population). It is noticeable that the incidence rates among adults above 30 years of age in 2018-2019 were higher than in previous influenza A seasons.

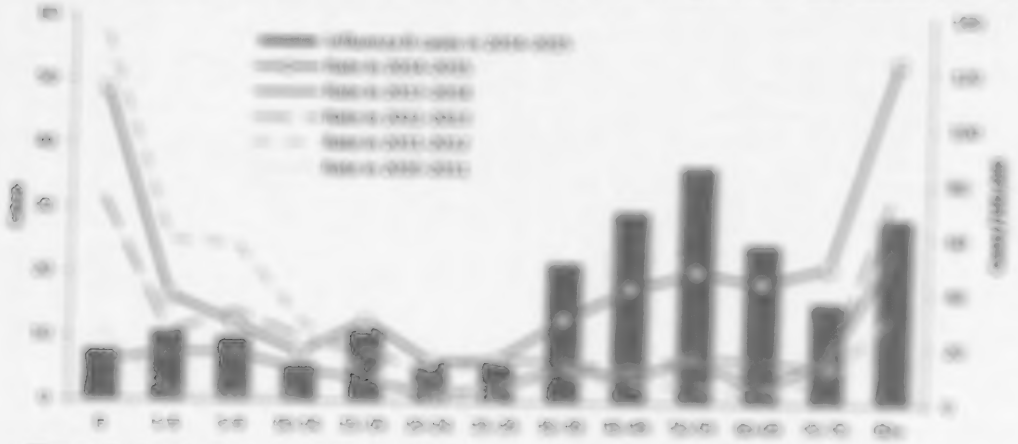

Figure 8 Incidence rate (/ 100,000) of influenza A by age group and season

[illegible]

Differences among RHAs were observed in the 2018-2019 season (Table 1). The highest incidence rate of influenza A was observed in Northern Health Region (100 cases per 100,000 population), followed by Prairie Mountain Health (100 cases per 100,000 population). The lowest incidence rate was recorded in Winnipeg RHA (59 cases per 100,000 population). The incidence rate of influenza A was relatively low in all RHAs. The highest incidence rate of influenza A also occurred in Northern

Health Region (39 cases per 100,000 population), followed by Interlake-Eastern RHA (33 cases per 100,000 population).

Table 1 Incidence rate (/100,000) of influenza A and B by RHA in 2014–2015

RHA	Influenza A		Influenza B	
	N	Rate Cases/100,000	N	Rate Cases/100,000
Winnipeg	430	57.7	79	10.6
Southern	164	86.9	38	19.9
Interlake-Eastern	104	82.1	42	33.2
Prairie Mountain	256	151.9	29	17.3
Northern	122	161.9	29	38.5
Manitoba	**1075**	**82.1**	**217**	**33.2**

Figure 10 compares the incidence rate of influenza A in 2014–2015 to the last four influenza A seasons among RHAs. Generally, the incidence rate in Winnipeg RHA was the lowest in all seasons except for in 2011–2012, which was an influenza B predominant season. It is noted that in Northern Health Region, the incidence rate was consistenly higher than other RHAs. However, it decreased significantly from 2013–2014 (301 cases per 100,000 population) to 2014–2015 (162 cases per100,000 population). A reliable incidence rate of influenza B for each RHA by season could not be calculated due to small numbers.

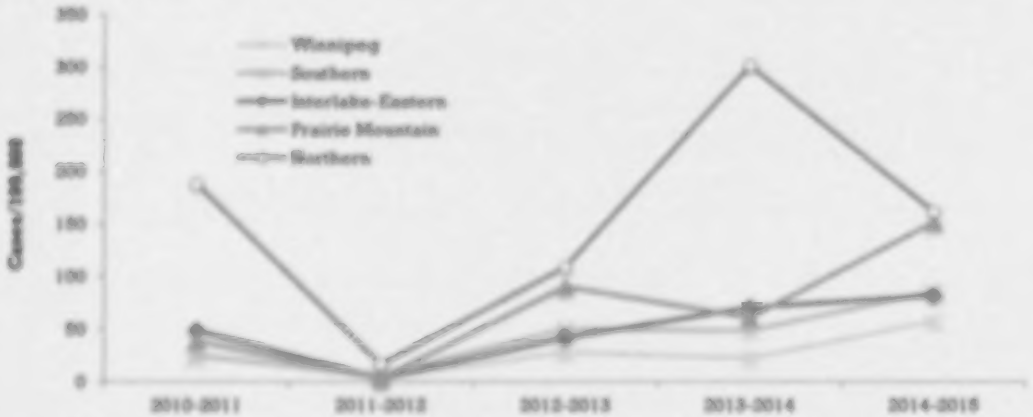

Figure 10 Incidence rate (/100,000) of influenza A by region and season

Hospitalizations, ICU Admissions and Deaths

To monitor the severity and burden of illness associated with influenza, each influenza season, RHAs are asked to submit a line list of hospitalizations, ICU admissions, and deaths to E&S at MHHLS on a weekly basis, which includes the lab requisition number, age, reporting RHA, and type/subtype of influenza. Aggregate numbers of hospitalizations, ICU admissions and deaths are also reported to PHAC for national surveillance on a weekly basis.

Hospitalized cases are defined as Manitoba residents with laboratory-confirmed influenza admitted to a hospital located within the reporting RHA. Meanwhile, the reason for hospitalization, ICU admission, or the cause of death does not have to be attributable to influenza. Instead, a temporal association

with a positive influenza laboratory result is sufficient for reporting. Influenza associated deaths may also be reported from other sources, including:

1. Chief Medical Examiner;
2. MOHs in RHAs; and
3. Infection Control Practitioners in long-term care facilities.

The number of severe outcomes associated with laboratory-confirmed influenza diagnosis in 2014–2015 was the highest since the 2009 pandemic season. There were 350 hospitalizations associated with the influenza diagnosis, among which 62 were ICU admissions (Table 2). A total of 48 influenza associated deaths were also reported, 26 of which occurred in hospitals and 18 in personal care homes. The majority of the hospitalizations (n=302, 86%), ICU admissions (n=46, 74%), and deaths (n=44, 92%) were associated with influenza A.

Table 2 Hospitalizations, ICU admissions and deaths by influenza type in 2014–2015

Type/subtype	Hospitalizations		ICU admissions		Deaths	
	N	%	N	%	N	%
Influenza A(unsubtyped)	201	57.4%	24	38.7%	21	43.8%
Influenza A(H3)	84	24.0%	20	32.3%	16	33.3%
Influenza A(H3N2)	17	4.9%	2	3.2%	7	14.6%
Influenza B	48	13.7%	16	25.8%	4	8.3%
Total	350		62		48	

The influenza A associated hospital admissions occurred between Week 47 (November 16–22, 2014) and Week 21 (May 24–30, 2015). They mostly occurred during the peak weeks of influenza A (69 admissions in Week 53, 62 admissions in Week 1, and 72 admissions in Week 2) and dropped to 40 admissions in Week 3 (January 18–24, 2015). Among those hospitalized cases, the ICU admissions occurred between Week 52 (December 21–27, 2015) and Week 20 (May 17–23, 2015). Of the 48 influenza associated deaths, the highest number (n=8) occurred in Week 53 (December 28, 2014–January 3, 2015) and Week 1 (January 4–10, 2015). Note that after the influenza A epidemic, since Week 5 (February 1–7, 2015), the severe outcomes associated with influenza, mostly influenza B, continued at a low level and were prolonged until the end of May 2015 (Figure 11).

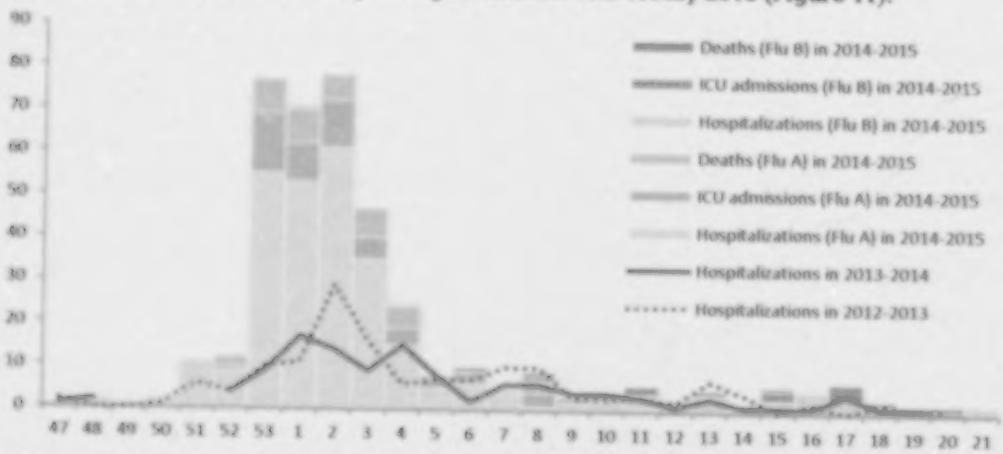
90
80
70
60
50
40
30
20
10
0
47 48 49 50 51 52 53 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Deaths (Flu B) in 2014-2015
ICU admissions (Flu B) in 2014-2015
Hospitalizations (Flu B) in 2014-2015
Deaths (Flu A) in 2014-2015
ICU admissions (Flu A) in 2014-2015
Hospitalizations (Flu A) in 2014-2015
Hospitalizations in 2013-2014
Hospitalizations in 2012-2013

Figure 11 Influenza associated hospitalizations, ICU admissions, and deaths by week in 2014–2015

In 2014–2015, a large proportion of influenza A cases were reported to have influenza associated severe diseases. In total, 28% of all influenza A cases were admitted to hospital, among which 15% were admitted to ICU, and 4% deceased.

Age was a significant factor linked to severe influenza associated outcomes. Generally, more influenza A associated hospitalizations, ICU admissions, and deaths were observed in an older age group (Figure 12). Most (n=184) or 70% of the influenza A associated hospitalizations occurred among those over the age of 70. Of the 44 influenza A associated deaths, the majority (n=38) or 86% occurred among those over the age of 70. The hospitalization rates among different age groups are also presented in Figure 12. Older people were more likely to have influenza A associated hospitalizations in 2014–2015, especially those over 80 years of age (226 hospitalizations per 100,000 population). Young children under the age of one were also likely to be hospitalized with influenza A diagnosis (97 hospitalizations per 100,000 population).

The increased risk for influenza associated severe outcomes among older adults is a combination of factors including the circulating influenza A(H3N2) strain linked to more severe disease, a large volume of outbreaks in long-term care facilities, and low vaccine effectiveness this season.

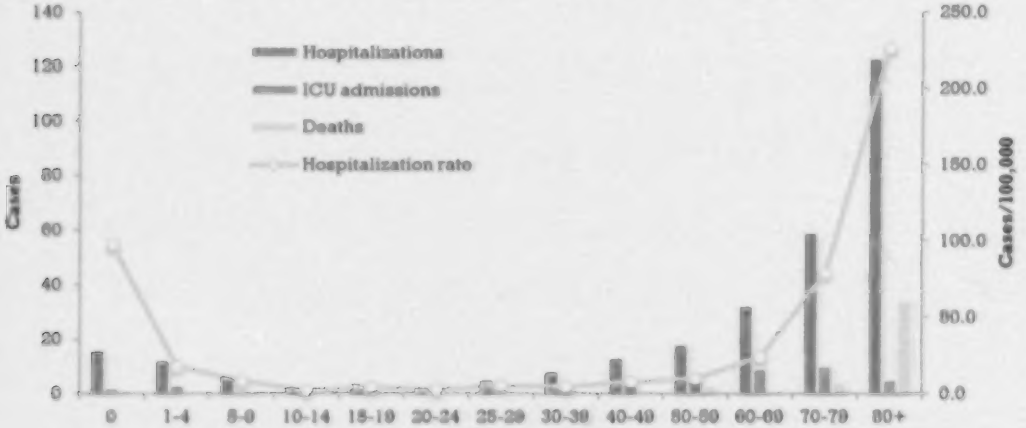

Figure 12 Influenza A associated hospitalizations, ICU admissions, and deaths by age group in 2014–2015

Compared to influenza A, influenza B was associated with fewer severe outcomes in 2014–2015, especially deaths (48 hospitalizations, 16 ICU admissions, and four deaths). Overall, 22% of all influenza B cases were admitted to hospitals (among which 33.3% were admitted to ICUs) and only 2% deceased. Hospital and ICU admissions associated with influenza B occurred more frequently among younger populations under the age of 60 (Figure 13). However, all four influenza B associated deaths occurred among people over 60 years of age.

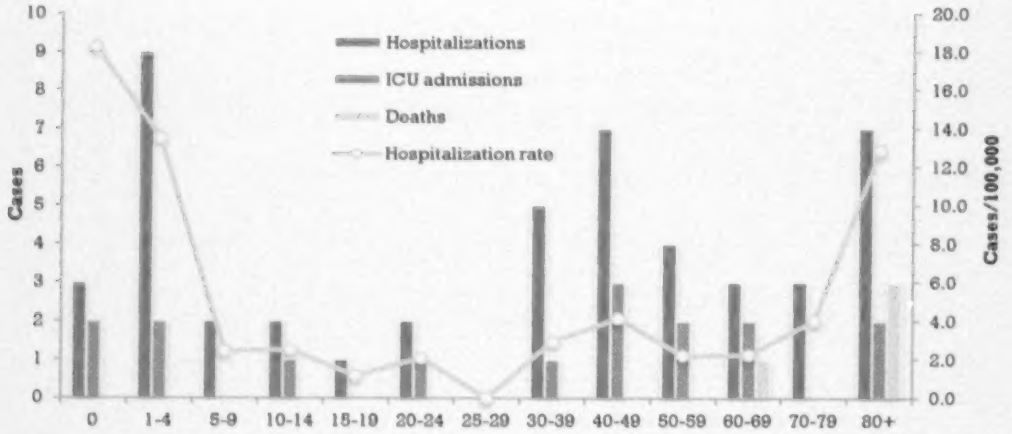

Figure 13 Influenza B associated hospitalizations, ICU admissions, and deaths by age group in 2014–2015

Laboratory-confirmed Outbreaks

As outlined in Manitoba's Communicable Disease Management Protocol Manual on Epidemiological Investigation of Outbreaks[3], the common definition of an outbreak is:

> The occurrence in a community or region of cases of an illness with a frequency clearly in excess of normal expectancy. The number of cases indicating presence of an outbreak will vary according to the infectious agent, size and type of population exposed, previous experience or lack of exposure to the disease, and time and place of occurrence. Therefore, the status of an outbreak is relative to the usual frequency of the disease in the same area, among the same population, at the same season of the year.[4]

Each influenza season, reports of suspected/confirmed influenza outbreaks are directed to E&S by a phone call/email from public health staff within RHAs or from CPL advising the assignment of an outbreak code. Outbreaks can also be submitted to E&S by completing an outbreak summary report.

In this report, only laboratory-confirmed reports of institutional influenza outbreaks are included, which means each outbreak had at least one laboratory confirmed case. Between June 29, 2014 and July 4, 2015, there were 105 outbreaks of laboratory-confirmed influenza reported in Manitoba: 93 outbreaks of influenza A, 11 outbreaks of influenza B, and one mixed outbreak of influenza A and B.

Outbreaks were reported in all RHAs: 51 in Winnipeg RHA, 17 in Southern Health-Santé Sud, 15 in Interlake-Eastern RHA, 20 in Prairie Mountain Health, and two in Northern Health Region. The majority of these outbreaks occurred in long-term care facilities. Similar to other indicators, the number of outbreaks by week increased in alignment with the laboratory reports of influenza A (Figure 14) with a peak in Week 53 (December 28, 2014–January 3, 2015).

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[3] http://www.gov.mb.ca/health/publichealth/cdc/protocol/investigation.pdf

[4] Chin, James (Editor). *Control of Communicable Disease Manual*. American Public Health Association, Washington DC, 2000.

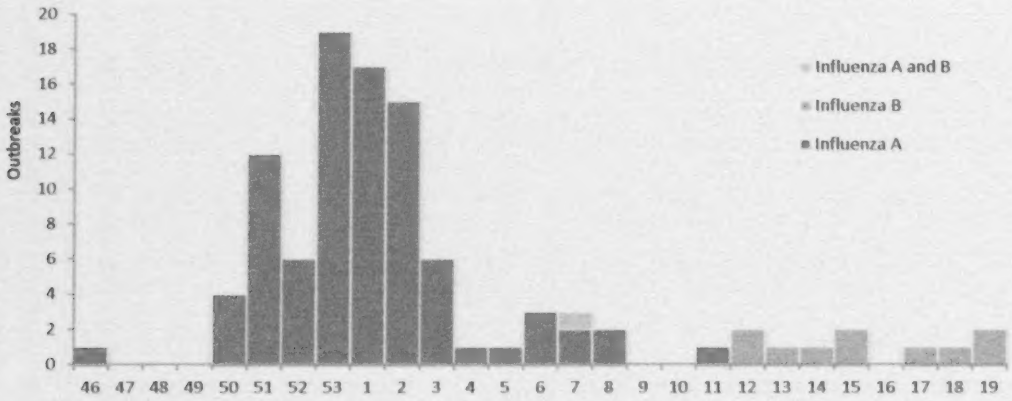

Figure 14 Outbreaks of influenza A and B by week in 2014–2015

Immunizations

Uptake

Influenza immunization data are routinely extracted from the Manitoba Immunization Monitoring System (MIMS), which contains information related to an immunization event including type of vaccine administered, date of administration and the service provider. Seasonal influenza immunization events in 2014–2015 were captured in MIMS in one of three ways:

- Immunizations administered by physicians were entered into MIMS via the physician billing system.
- Immunizations administered by pharmacists were submitted to MHHLS and were manually entered into MIMS by data entry staff at MHHLS.
- Immunizations administered by all other providers including public health nurses were recorded by data entry staff in the RHAs.

In 2014–2015, the seasonal influenza vaccine (inactivated influenza vaccine) was available free-of-charge to all Manitobans over 6 months of age. As with previous years, MHHLS conducted a targeted, universal program with focus on those at increased risk of serious illness from influenza, their caregivers and close contacts including:

- Seniors aged 65 or older
- Residents of a personal care home or long-term care facility
- Health care workers and first responders
- Children 6 to 59 months of age
- Individuals of Aboriginal ancestry
- Those with chronic illness, such as:
  - Cardiac or pulmonary disorders (including bronchopulmonary dysplasia, cystic fibrosis and asthma);
  - Diabetes mellitus and other metabolic disorders;
  - Cancer, immune compromising conditions (due to underlying disease and/or therapy);
  - Renal disease;

  - Anemia or hemoglobinopathy;
  - Conditions that compromise the management of respiratory secretions and are associated with an increased risk of aspiration; and,
  - Children 6 months to adolescents 18 years of age on long-term acetylsalicylic acid (i.e. Aspirin) therapy
- People who are severely overweight or obese
- Healthy pregnant women

In addition, international students, visitors and newcomers were eligible to receive the flu vaccine free-of-charge regardless of third party insurance and/or MHHLS coverage.

As per the World Health Organization (WHO), all seasonal trivalent influenza vaccines for the 2014–2015 season in the northern hemisphere contained:

- an A/California/7/2009 (H1N1)pdm09-like virus;
- an A/Texas/50/2012 (H3N2)-like virus;
- a B/Massachusetts/2/2012-like virus.

This was the first year that the live attenuated influenza vaccine, FluMist® (nasal spray), was also included in Manitoba's influenza immunization program. FluMist® was offered to children and youth 2 to 17 years of age. Initially, FluMist® Quadrivalent was offered in Manitoba, which provided protection against an additional influenza B strain, the B/Brisbane/60/2008-like virus. As a result of manufacturers' production delays, FluMist® Trivalent was offered in Manitoba for the remainder of the season.

All seasonal influenza immunizations entered in MIMS were captured using tariff codes including 8791, 8969, and 8968. By end of March, 2015, it was found that the highest uptake was among Manitobans aged 65 years and over (54.8%) followed by the 0–2 year-old age group (20.6%), the 19–64 year-old age group (17.1%), and the 3–18 year-old age group (12.2%). This end of season report analyzed the immunization data in more detail.

Between July 1, 2014 and June 30, 2015, a total of 297,489 vaccine doses were administered to 291,567 people. Only four doses were not publicly funded. Particularly, 297,092 doses were administered to 291,249 people between September 1, 2014 and March 31, 2015, the 2014–2015 influenza immunization season. In this report, only the doses delivered during the 2014–2015 immunization season were analyzed.

The overall influenza vaccine uptake rate in Manitoba was 22.3% in the 2014–2015 influenza immunization season. The highest uptake was among people over 80 years of age (64%) followed by people aged between 70 and 79 years (57%) and those aged between 60 and 69 years (42%). The lowest uptake, around 8%, occurred among those aged between 15 and 24 years (Figure 15).

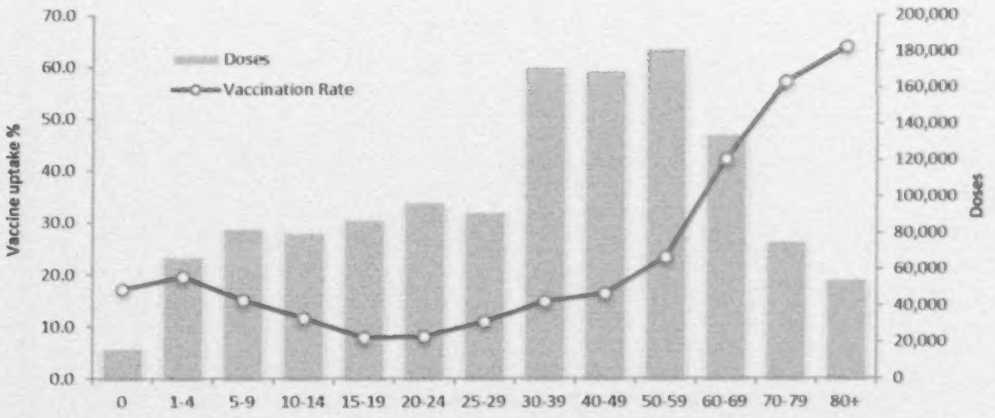

Figure 15 Influenza immunization uptake rate (%) by age group in 2014–2015

There were differences in vaccine uptake among RHAs (Table 3). The highest uptake was observed in Winnipeg RHA (25%) and the lowest in Southern Health-Santé Sud (16%).

Table 3 Influenza immunization uptake rate (%) by region and age group in 2014–2015

Age	Winnipeg	Southern	Interlake Eastern	Prairie Mountain	Northern	Manitoba
0	25.2	7.4	14.6	8.2	8.6	**17.1**
1-4	25.5	11.3	16.4	12.9	15.1	**19.5**
5-9	18.3	8.8	12.6	11.7	16.4	**15.0**
10-14	13.9	5.9	9.6	9.4	14.1	**11.6**
15-19	9.1	4.4	6.3	6.5	9.8	**7.8**
20-24	9.1	4.4	6.8	6.7	10.6	**8.0**
25-29	11.6	7.4	9.6	10.2	14.1	**10.9**
30-39	16.3	10.2	12.6	12.7	16.5	**14.7**
40-49	18.2	10.9	13.2	14.8	18.1	**16.3**
50-59	25.1	17.8	21.4	22.3	24.8	**23.3**
60-69	44.4	36.6	41.5	39.5	40.5	**42.2**
70-79	59.7	51.9	55.3	54.7	49.9	**57.1**
80+	66.2	58.7	59.1	62.8	55.7	**63.9**
Total	**24.5**	**16.0**	**21.6**	**21.8**	**18.7**	**22.3**

Differences in immunization uptake between RHAs were more evident among children under the age of one (Figure 16). Compared to Winnipeg RHA (25%), vaccine uptake among children under one was much lower in Southern Health-Santé Sud (7%), Prairie-Mountain Health (8%), Northern Health Region (9%), and Interlake-Eastern RHA (15%). There were also inconsistencies across age groups. In Northern Health Region, people under 10 years of age and over 60 years of age had lower vaccine uptake rates compared to people within the same age groups in Winnipeg RHA. However, people between 10 and 60 years of age in Northern Health Region had a similar vaccine uptake rate compared to people in the same age group in Winnipeg RHA.

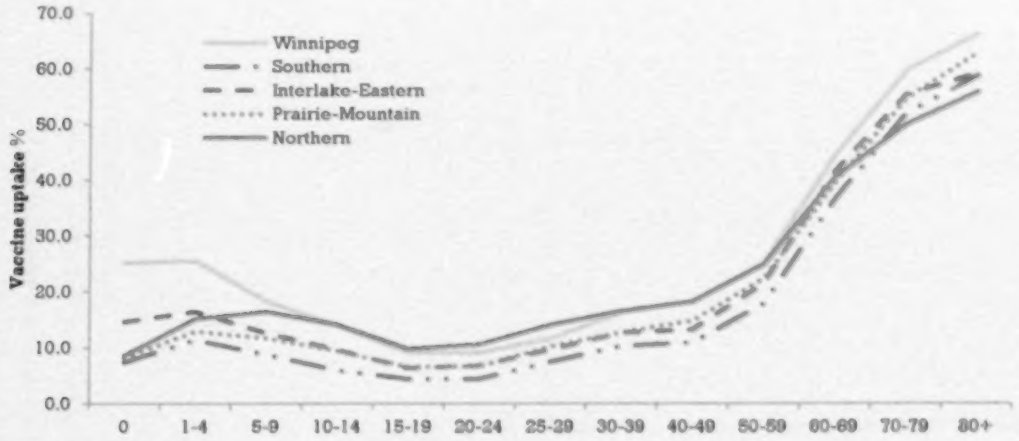

Figure 16 Influenza immunization uptake rate (%) by region and age group in 2014–2015

Providers

Similar to previous influenza immunization seasons, public health nurses and physicians in 2014–2015 were two major groups of immunization service providers. Each group administered almost 38% of all doses. Newly eligible to administer seasonal influenza vaccines, pharmacists delivered a substantial amount of service, 49,642 doses or 17% of the total administered in Manitoba during the 2014–2015 immunization season (Table 4).

Table 4 Influenza vaccine doses by provider type and month in 2014–2015

Month	Public Nurse	Physician	Pharmacist	Other	All (% of total)
Sept. 2014	386	177	23	46	612 (0.2%)
Oct. 2014	80,724	29,848	20,880	13,904	145,356 (48.9%)
Nov. 2014	25,080	58,435	23,783	9,356	116,654 (39.3%)
Dec. 2014	3,030	16,499	3,787	1,078	24,394 (8.2%)
Jan. 2015	1,770	4,765	1,050	326	7,911 (2.7%)
Feb. 2015	232	1,284	109	93	1,718 (0.6%)
Mar. 2015	92	324	10	21	447 (0.2%)
Total	**111,294**	**111,332**	**49,642**	**24,824**	**297,092**
(%)	**(37.5%)**	**(37.5%)**	**(16.7%)**	**(8.4%)**	

Almost 90% of all doses were administered in October and November of 2014. However, providers distributed their service differently time-wise. Public health nurses delivered more doses in October (n=80,724) than in November (n=25,080) and physicians delivered more in November (n=58,435) than in October (n=29,848). In comparison, pharmacists delivered a similar amount of doses, 29,848 and 23,783 respectively, in each of the two months (Figure 17). Due to manufactory delays, Manitoba started to receive its influenza vaccine supply intermittently since mid-October as opposed to mid-September when influenza vaccines are expected to be received each year.

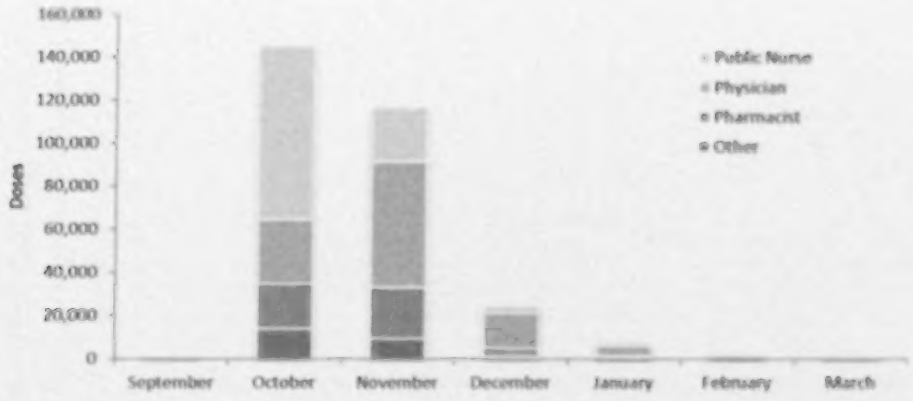

Figure 17 Influenza vaccine doses by provider type and month in 2014–2015

The distribution of service by each provider also varied among age groups of clients (Table 5). Public health nurses were the major service providers among all Manitoba residents above the age of one, providing nearly 38% of all doses. Physicians were the major service providers among children aged between 6 months and four years. Especially, more than three quarters of the doses administered to those less than one year of age were delivered by physicians. Pharmacists were important service providers among people over seven years of age, administering almost 17% of all doses.

Table 5 Influenza vaccine doses (%) by provider type and client age group in 2014–2015

Age	Physician	Public Nurse	Pharmacist*	Other	Total
0	3,472 (76.16%)	925 (20.29%)	5 (0.11%)	157 (3.44%)	4,559
1–4	8,941 (60.06%)	5,370 (36.07%)	48 (0.32%)	527 (3.54%)	14,886
5–17	10,459 (39.87%)	11,607 (44.24%)	3,438 (13.11%)	730 (2.78%)	26,234
18–64	49,292 (34.40%)	52,229 (36.45%)	27,685 (19.32%)	14,088 (9.83%)	143,294
65+	39,168 (36.23%)	41,163 (38.07%)	18,466 (17.08%)	9,322 (8.62%)	108,119

**As per The Manitoba Pharmaceutical Act and Regulations, pharmacists are authorized to administer seasonal influenza immunizations to people 7 years of age and older.*

Adverse Events Following Immunization (AEFI)

Per *The Food and Drugs Act* and Regulations, vaccine manufacturers are required to report to PHAC all serious AEFI reports with vaccines for which they are the Market Authorization Holder within 15 days of knowledge of their occurrence. No other legal requirement for reporting AEFI exists nationally.

An AEFI is reportable under *The Public Health Act* as prescribed in the Immunization Regulation (C.C.S.M. c.P210) if it is temporally associated with an immunizing agent, cannot be attributed to a co-existing condition, and if it meets at least one of the following criteria:

a. the event is life-threatening, could result in permanent disability, requires hospitalization or urgent medical attention, or for any other reason is considered to be of a serious nature;
b. the event is unusual or unexpected, including, without limitation,
    a. an event that has not been previously identified, or

b. an event that has been previously identified but is being reported at an increased frequency;

c. at the time of the report there is nothing in the patient's medical history — such as a recent disease or illness, or the taking of medication — that could explain the event.

Health care professionals who become aware of reportable adverse events are to report them within 7 days by completing and faxing the AEFI form[1] to their regional MOHs.

A total of 39 influenza vaccine related AEFI reports were received during the 2014–2015 immunization season, which were dated between October 14, 2014 and January 29, 2015. Overall, the incidence rate of AEFI was 13.1 episodes per 100,000 doses administered. By age group, the highest incidence rate of AEFI occurred among children under one year of age (Table 6).

Table 6 Adverse events following influenza immunization by age group in 2014–2015

Age group	N	Rate (/100,000 doses)
0	1	21.9
1–4	0	0.0
5–17	5	19.1
18–64	26	18.1
65+	7	6.5

The majority of reported AEFIs were for allergic or allergic-like reactions (n=22 or 41%), followed by local reactions (n=14 or 26%). There was one report of anaphylaxis, and two reports of oculo-respiratory syndrome (Table 7). Because some individuals experienced more than one reaction in a single episode, there was a greater number of reactions (n=54) than reports submitted (n=39).

Table 7 Types of adverse events following influenza immunization in 2014–2015

Adverse event	N	%
Local reaction	14	25.9%
Allergic or allergic-like event	22	40.7%
Anaphylaxis	1	1.9%
Oculo-respiratory syndrome	2	3.7%
Neurologic events	4	7.4%
Other defined event of interest	11	20.4%
Total	**54**	

Various levels of care were required for these AEFIs. Only eight individuals with AEFIs required an emergency visit (21%) and the rest required either low levels of care or no care (Table 8).

No AEFIs were reported to result in death (Table 8). At the time of reporting, almost half of the individuals experiencing AEFIs had fully recovered (n=18 or 46%).

[1] http://www.gov.mb.ca/health/publichealth/cdc/docs/aefi_form.pdf

Table 8 Levels of care required and outcomes for adverse events following influenza immunization in 2014-2015

Level of care required by patients	N	%	Patient outcome	N	%
None	9	23.1%	Fully recovered	18	46.2%
Telephone advice from health professional	9	23.1%	Not yet recovered	18	46.2%
Non-urgent visit	13	33.3%	Permanent disability	0	0.0%
Emergency visit	8	20.5%	Death	0	0.0%
Hospitalization	0	0.0%	Unknown	3	7.7%
Prolongation of existing hospitalization	0	0.0%	**Total**	**39**	

Antiviral Dispensing

The daily units of antiviral drug, Oseltamivir (Tamiflu®), dispensed to Manitoba residents during the influenza season are obtained on a weekly basis from Drug Programs Information Network (DPIN) since October 1 during each influenza season. Only drugs dispensed from community retail pharmacies could be included in this report and those dispensed to in-patients or through nursing stations could not be included due to lack of data.

Between October 1, 2014 and June 6, 2015, a total of 2,592 units of Oseltamivir were dispensed from community retail pharmacies. The units of Oseltamivir dispensed each week closely paralleled the numbers of laboratory-confirmed influenza cases (Figure 18) with a one-week delayed peak in Week 1 (January 4–10, 2015). Compared to the 2013-2014 season, considerably more units of Oseltamivir were dispensed in December and January between Week 50 (December 7–13, 2014) and Week 5 (February 1–7, 2015).

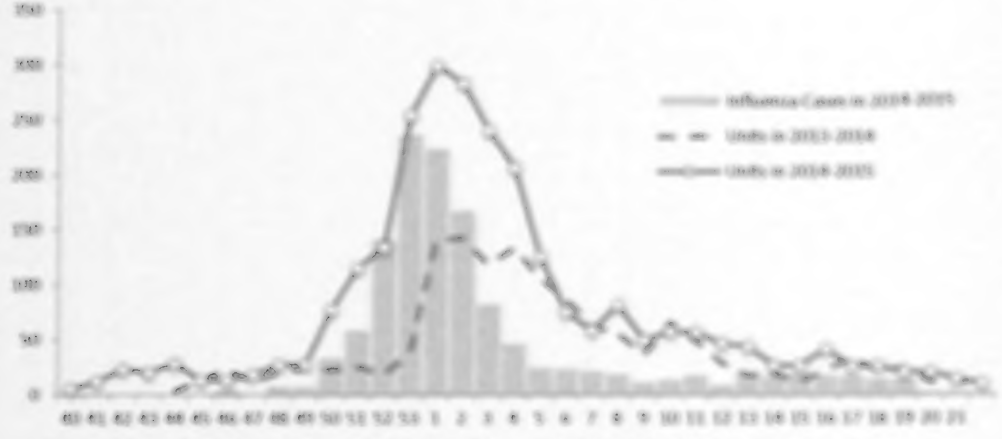

Figure 18 Units of Oseltamivir dispensed by week in 2014-2015

Strain Characterization and Antiviral Resistance

Influenza and Respiratory Viruses Section of National Microbiology Laboratory (NML) undertakes enhanced surveillance, investigations, and research on influenza and other respiratory pathogens. Additionally, NML develops, evaluates, and improves new molecular techniques and reagents for

early detection and identification of potential epidemic and pandemic influenza strains and other new emerging respiratory viruses. As a routine practice, NML also antigenically characterizes influenza viruses received from Canadian laboratories. In Manitoba, a random sample of positive influenza specimens isolated by culture is referred from CPL to NML for strain characterization. Routine testing for antiviral resistance is also performed by NML. The aggregate level information is then shared with provinces and territories on a weekly basis.

In Canada, the 2014–2015 season was predominated by the A/Switzerland/9715293/2013-like strain, which was related to, but antigenically and genetically distinguishable from, the A/Texas/50/2012 vaccine virus. Influenza viruses of the B/Yamagata lineage predominated among the influenza B viruses detected, which were similar to B/Massachusetts/02/12, the vaccine virus included in the trivalent vaccines. Between September 1, 2014 and July 4, 2015, NML reported that it had antigenically characterized 36 influenza viruses from Manitoba (Table 9). All 10 influenza A (H3N2) viruses characterized were antigenically similar to A/Switzerland/9715293/2013 and the 26 influenza B viruses were antigenically related to B/Massachusetts/02/12.

Table 9 Strain characterization of influenza isolates in Manitoba and Canada in 2014–2015

Influenza Strain	Canada	Manitoba
A/Switzerland/9715293/2013(H3N2)-like	2036	10
A/Texas/50/2012(H3N2)-like	0	0
A/California/07/09(H1N1)-like	21	0
B/Massachusetts/02/12-like	790	26
B/Brisbane/60/2008-like	08	0

Note: Reports between September 1, 2014 and July 4, 2015

Between September 1, 2014 and July 4, 2015, NML reported that all influenza isolates submitted from Manitoba were susceptible to Oseltamivir and Zanamivir, although nationally one influenza A(H3N2) isolate demonstrated resistance to Oseltamivir (Tables 10). All Manitoba viruses tested were resistant to Amantadine.

Table 10 Antiviral resistance of influenza isolates in Manitoba and Canada in 2014–2015

Virus	Oseltamivir		Zanamivir		Amantadine	
	Resistant	Sensitive	Resistant	Sensitive	Resistant	Sensitive
Manitoba						
A(H3N2)	0	73	0	72	122	0
A(H1N1)	0	0	0	0	0	0
B	0	50	0	50	N/A	N/A
Canada						
A(H3N2)	1	967	0	968	1457	1
A(H1N1)	0	22	0	22	23	0
B	0	804	0	804	N/A	N/A

Note: Reports between September 1, 2014 and July 4, 2015

Discussion

Influenza surveillance is inherently biased towards more severe outcomes and this annual report serves to characterize severe cases and to monitor broad trends. The burden of influenza is likely underestimated due to the lack of a true denominator for all individuals infected because not all

individuals experiencing symptoms will seek medical attention and not all clinicians will routinely test cases of ILI for influenza. Additionally, during influenza seasons, factors such as circulating strains, vaccine formulation, and heightened public awareness can result in less or more health-seeking behaviours, which might influence findings.

In the 2016-2017 influenza season, Manitoba experienced the highest morbidity and mortality since the 2009 pandemic season. As routine reporting of laboratory-confirmed influenza cases began in 2009 and there have been only two influenza A(H3N2) predominant seasons including the 2016-2017 season, it is difficult to determine whether the increased laboratory activity this season was higher than expected in an influenza A(H3N2) predominant season.

The predominant circulating influenza A(H3N2) strain was a major contributor to the increased morbidity and mortality in the 2016-2017 season, especially among older populations. In the past, influenza A(H3N2) predominant seasons have been linked to more severe illness and higher mortality, especially among older people and young children, compared to influenza A(H1N1) or influenza B predominant seasons. The severity in 2016-2017 was evidenced by a number of influenza associated hospitalizations, ICU admissions, and deaths that was higher than in any of the previous seasons.

The vaccine mismatch was another major contributor to the severity of influenza in 2016-2017. The predominant circulating influenza A(H3N2) strain was antigenically distinct from the 2016-2017 northern hemisphere vaccine, which resulted in near zero vaccine effectiveness against the circulating influenza A(H3N2) strain. The mid-season estimate of vaccine effectiveness in Canada was -9% (95% confidence interval: -50%–22%) against influenza A(H3N2) virus infections in patients with medically attended ILI[1]. In the United States, the seasonal vaccine effectiveness estimate was 14% against influenza A(H3N2) virus infections (95% confidence interval: 8%–20%)[2].

The influenza activity observed by two syndromic indicators under surveillance in 2016-2017, ILI consultations and influenza-related calls to Health Links–Info Santé, paralleled the activity observed by the laboratory-confirmed influenza infections instead of peaking prior, a trend observed in previous seasons. To prepare for future influenza seasons like 2016-2017, more indicators that could detect the increase of influenza activity should be explored and tested.

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[1] Skowronski, D.M. et al. (2016). Interim estimates of 2016/17 vaccine effectiveness against influenza A(H3N2) from Canada's Sentinel Physician Surveillance Network, January 2016. *Euro Surveillance*, 21(6).
[2] CDC Presents Updated Estimate of Flu Vaccine Effectiveness for the 2016-2017 Season
http://www.cdc.gov/flu/news/updated-vaccine-effectiveness-2016-17.htm